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ABSTRACT

This paper surveys issues that draw together instructional technology (IT) with the goals of the traditional classroom curriculum. Ways that IT serves to further the traditional educational goals of developing lifelong learners who function with skills, knowledge, and wisdom are examined, as well as the potentials and challenges of IT. The first section addresses the challenges of using IT in the classroom, including the importance of IT tools and the knowledge about how to use them. The second section makes predictions about technology growth in education over the next 10 years. The third section discusses the following statements related to where IT fits into teachers' concerns: (1) My students will use IT ethically and productively as citizens of their nation and the world; (2) My students will learn to think critically about information presented to them; (3) My teaching efforts will be designed to meet students at their appropriate reading and learning levels; (4) My students will be able to find information from a wide variety of sources and reorganize it to make it personally meaningful; and (5) All my students, regardless of socioeconomic or other factors, will be successful in my classroom. (Contains 20 references.) (MES)

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Is Instructional Technology All Worthwhile?

I'm Retiring in the Next Decade

Ernest Balajthy

State University of New York at Geneseo

Geneseo, NY 14454

(o) 716-245-5254

(fax) 716-245-5220

e-mail: Balajthy@geneseo.edu

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Is Instructional Technology All Worthwhile?

I'm Retiring in the Next Decade

Ernest Balajthy

State University of New York at Geneseo

In his widely-cited article "The Computer Delusion", Oppenheimer called the use of computers in the classroom "the filmstrip of the nineties" (1997, p. 47). He asserted that there is no evidence that computers help students learn, and he argued that the billions of dollars being spent on computer hardware and software would be better spent in hiring more teachers and establishing innovative special programs that address critical needs. In fact, Kamp (1999) reported that educational institutions spent $4.8 billion on computer technology in 1997-1998 and $5.4 billion in 1998-1999.

Why is it that the viewpoints of an editor employed by Newsweek have aroused so much debate in educational and political circles? Could it be that there is more than just a grain of truth in his argument that we have been deluded by glitzy technology into expenditures that could have been far better spent supporting other, more research-based, educationally sound practices? And why have responses from technology advocates been strongly worded--but oddly devoid of substantive content

to back their positions? Reports supporting use of Instructional Technology are too often based on subjective opinion polls rather than on substantive quantitative research. Oppenheimer, however, dismisses opinion and observation far too readily. Seventy-eight percent of teachers report that they have seen evidence of achievement gains due to computer use, and ninety-five percent believe that achievement of low-performing students can be enhanced by computers, according to Kamp, 1999. Can so many teachers be so far wrong? Oppenheimer also ignores the large body of research that does exist to support use of computers in classrooms, such as the 1999 Research Report on the Effectiveness of Technology in Schools, by Sivin-Kachala, Bialo, & Langford, 1999.

A large part of the problem is that the national debate over Instructional Technology misses the point. Educators and politicians continue to advocate some use of computers for, in essence, replacement of teachers: "Buy new computers for your school and home and you will increase student achievement without the need for more and better-educated teachers, smaller class sizes, and more classroom space. And, at $1500 per computer as compared to well over $50,000 per year in median teacher salary and benefits, it's a good buy!"

These views were called into question right from the start of research on Instructional Technology. That research led to the principle that teaching is best done by human teachers. No amount of sophisticated

multimedia is going to change that principle, no matter how strongly and repetitively technology advocates hail the wonders of Instructional Technology.

But Oppenheimer's criticisms miss the point, as well. He writes off the use of classroom computers all too quickly, blindly dismissing the use of computers as a faddish tool similar to use of filmstrips in the 1960s. The analogy between filmstrips and computers breaks down quickly upon examination. Filmstrip projectors were never as ubiquitous in homes or workplaces as computers are today. The computer has become an indispensable tool.

What Challenges Do I Face as I Use IT in My Classroom?

Instructional Technology is, first of all, a set of tools. Some of those tools are of key importance. Word processing software has long been recognized as the personal computer tool of most importance. More recently, the usefulness of web browsers has been recognized as research sources on the Internet rise in quantity and quality. Other tools may be less important. It is important for everyone to understand the general principles involved in using technologies such as database software, scanners, digital cameras, desktop publishing software--and the many other manifestations of technology. But detailed study of how to operate such tools can usually wait until the need for them arises. Still yet other tools, such as software for CAD (computer-assisted design) or musical

composition or accounting, are so specific to certain vocations as to be worthy of only brief mention in most classrooms. The tools applicable to literacy classroom are so numerous as to be almost daunting.

IT is also knowledge about how to operate those tools competently. This is what most people think of when they hear the term "computer literacy." For many years, the amount of effort needed to gain knowledge about how to use these tools outweighed the usefulness of the tools for most people. What do I do when:

*the wrong key is pressed and important text disappears from the screen?

*the printer won't work?

*a section of text needs to be underlined?

The list goes on and on. We have a long way to go in terms of increasing the user friendliness of IT, but we have come a long way, as well. Hardware is much more reliable today, software is far easier to use, help is more readily obtained in schools, businesses, computer stores, through email, and even in homes as children and parents develop expertise through use of computers at school and at work.

Most importantly, IT is knowledge and wisdom to use these tools appropriately to meet our goals for the education of students. We may think at first that IT presents unique challenges to us as we seek to develop knowledge and wisdom in our students. We hear a lot in the

media, for example, about difficulties with the Internet. Yet teachers have always helped students face such challenges. Challenges are an integral part of the process of education. Making judgments about quality of information in the media, making decisions about ethical issues, sorting through data to draw one's own conclusions--all of these are part of the requirements for being a literate, educated human being at the start of the twenty-first century. IT puts a slightly new face on these issues, but they are all issues that teachers have comfortably faced for as long as the profession has existed.

The purpose of this chapter is to survey a variety of issues that draw together IT with the goals of the traditional classroom curriculum. I will attempt to show how IT serves to further our traditional educational goals of developing lifelong learners who function with skills, knowledge and wisdom. Along the way, I will also look at how IT offers unique potentials and unique challenges to our efforts to achieve those goals.

Where Will IT Take Us Over the Next 10 Years?

Predictions about technology growth in education are notoriously exaggerated. I have tried to be conservative here.

* Virtually every middle class and working class home will have a very powerful computer with access to the Internet. Even today, fifty percent of American homes have computers and about one-fifth of homes

have Internet connections (Kamp, 1999). Unfortunately, students from disadvantaged backgrounds will continue to bring less experience with computers to the classroom. Schools serving such students will face the challenge of providing technology experiences in order to compensate for economics.

* Classwork and homework assignments using computer technology will be commonplace. Many teachers will feel free to make assignments that involve use of the Internet and common application software such as word processing, databases, desktop publishing, and spreadsheets.

* Schools, most adults, and almost all parents, will pay nominal subscription fees to online services that provide up-to-date, comprehensive libraries of information. These libraries will include access to online, top-quality encyclopedias, multimedia and educational software such as is often found on CD-ROMs today, and current illustrated news magazines such as Time or Newsweek. The services will also provide automatic filtering for inappropriate websites and email.

* Personal computer models will include the following peripherals as standard:

--Flat-screen (LED) monitors of higher quality and brightness than today's

--Digital cameras that take pictures and allow visual "phone calls" over the Internet

--Color scanners that allow digitization of both text and pictures

--DVD-ROM drives that are "writeable" and have more memory than today's memory storage devices

--Photographic-quality color printers

* Parents will continue to spend almost all of their technology dollars on hardware. Most of the software purchases will be video games. The latest, most powerful and popular educational software will continue to be marketed as individual items in computer stores and over the Internet. As now, relatively little useful, up-to-date direct instructional software will be available in homes, and parents will not consistently enforce its use.

* With technology ubiquitous in the home and in the workplace, parents will demand that computers play an important role in classrooms at all educational levels.

* Having had more than three decades to put computers to use, public schools will have a large pool of teachers who are highly qualified to use them successfully. Those teachers, given time to do so, will serve as a readily available resource to other teachers who are less qualified. Qualified parent and community volunteers will help with classroom technology activities, just as many now volunteer to serve as math or reading aides. Students from the earliest levels will be technologically

literate and able to function independently with all types of technology.

Where Does IT Fit Into My Concerns as a Teacher Today?

My Students Will Use IT Ethically and Productively as Citizens of Their Nation and the World

One of the most often-voiced concerns about educational applications of the Internet has to do with whether students will learn to use this valuable resource in productive ways. Educators and parents must provide students with clear guidance as to appropriate use of the Internet--or indeed, of any sources of information or forms of communication.

Insert Textbox 2: Internet Acceptable Use Policies

Electronic media present powerful, easy-to-use tools to steal the intellectual property of others, what McKenzie (1998) calls the "new plagiarism." McKenzie has suggested that the traditional educational approach of assigning topical research has always encouraged plagiarism, since such assignments are mere information gathering and reporting exercises (for example, "Find out all you can about Ecuador and write an essay on it."). Teachers can think through student-centered assignments

that involve higher-level tasks, such as comparing, contrasting, making choices, and weighing information to make judgments and conclusions.

Insert Textbox 3: Avoiding the "New Plagiarism"

Bruce (1997) described such effects of technology on the classroom curriculum as a transactional relationship. New technologies transform literacy acquisition and literacy instruction. But at the same time, teachers transform the technologies to accomplish their objectives.

My Students Will Learn to Think Critically About Information Presented to Them

Free speech, with accompanying tolerance of divergent expression and tolerance of error, is a foundational value of enormous importance. As a country, we have long recognized the power of free speech to work for the good of all. In recent classes, my students have studied the political novels of exiled Kenyan author Ngugi wa Thiongo. We have explored the Internet to study widely diverging views on the state of human rights in Kenya. The Kenyan Embassy's website and websites of political dissidents provide conflicting information.

The power of the Internet for good is enormous. During the attempted coup in the Soviet Union in the early 1990's, the Internet

provided the outside world with vital information. Computer users in Moscow were able to provide the world with critically important information as soon as events occurred. But stories abound as to the spread of unreliable information on the Internet. Such stories are occasionally read by reporters and then disseminated further through the traditional mass media. Stories about the supposed involvement of a U.S. Navy missile ship in the destruction of TWA Flight 800 and the disputed facts as to CIA distribution of drugs to African-Americans are examples of how unreliable information can be spread widely as the result of Internet misuse. Internet enthusiasts sometimes defend the unreliability of its information by pointing out that even traditional media are unreliable.

In addition, the use of the Internet as a commercial advertising medium reinforces the need for students to receive consumer education. Many of the most popular websites have very heavy commercial content. The ambitious Disney site (http://www.disney.com), for example, is well-designed as a large, entertaining advertisement for Disney media products. students need to be helped to learn about how marketers use a host of tactics to encourage spending on their products.

Students need instruction in the concepts underlying free speech and the open marketplace of ideas. They need to learn how to sort through enormous amounts of information that is often unreliable and

contradictory.

As people become more familiar with various Internet resources, they will learn to distinguish reliable sites from unreliable, just as people today distinguish between the reliability of such information outlets as The New York Times from the National Inquirer. Using the Internet, valuable lessons can be created to distinguish useful from misleading information.

Another general principle of encouraging thoughtful, critical analysis has to do with learning as a social activity. If learning is indeed socially mediated, then widespread use of collaborative methods, integrated with technology, offers tremendous potential. Use of such classroom devices as networked word processing systems and long distance e-mail projects is being examined by researchers and found to have exciting potential (Fey, 1997).

Insert Textbox 4: Collaborative Internet Research Guide

My Teaching Efforts Will Be Designed to Meet Students at Their Appropriate Reading and Learning Levels

Teachers understand the principle of avoiding use of traditional print materials written at students' frustration levels. Similarly,

teachers should carefully preview websites to assess their readability. A student's random surfing of the net on a high-interest topic such as dolphins might lead to esoteric biological research that is written for university researchers.

Teacher planning time is necessary to find sites that match curriculum and learning levels of students. This is particularly important as new websites are constantly being created and old websites change addresses or go inactive.

One important new resource for teachers that will provide appropriate levels of instruction is the host of new websites created by students for students. These sites lack the glitzy "bells and whistles" of some commercial websites, and quality varies considerably. With teacher oversight, students at a wide variety of reading levels can find appropriate material on many different subjects. For example, Anne Keller, a third grade teacher from Arizona, has used annual units on African animals to have her students create research reports. The reports are posted on the Internet (http://www.havasu.k12.az.us/starline/akeller/african_animals.htm) and can be accessed by other classes to be used as resources.

Another important resource for students is electronic books (See Chapter 4 for a description and examples.). Research is quite positive about the benefits of such electronic text (Anderson-Inman, in press;

McKenna, Reinking & Labbo, 1997; McKenna, Reinking, Labbo & Kieffer, 1999).

My Students Will Be Able to Find Information From a Wide Variety of Sources and Reorganize It to Make It Personally Meaningful

Successful use of the Internet by students requires that teachers provide increased instruction, modeling, and practice in dealing with multiple sources and nonlinear presentation of ideas. Warnings similar to those that have criticized educational television shows such as Sesame Street may have some degree of truth. Himmelfarb (1996), for example, has suggested that

> Young students constantly exposed to "multimedia" and "hypermedia" replete with sound and images often become unable to concentrate on mere "texts" (known as books), which have only words and ideas to commend them. Worse yet, the constant exposure to a myriad of texts, sounds, and images that are only tangentially related to each other is hardly conducive to the cultivation of logical, rational, systematic habits of thought (p. A56).

Yet, the randomness and nonlinearity of the web may offer real benefits in

terms of learning style for the new postmodern generations. Research will be needed to investigate the potential effects of the Internet's unique form of accessing information.

We increasingly recognize the complexity of many important issues in our world. On the one hand, the ready availability of massive amounts of textual and multimedia information on world events strengthens the possibility that we can be truly informed decision makers. On the other hand, we are greatly challenged by the need to sort through that information, differentiating what is repetitive from what is new, what is reliable from what is unreliable, and what is fact from what is opinion.

The Internet can be a tool in our classrooms to give students experiences in dealing with large amounts of divergent information on issues of interest. Students can experience what it means to be "lost in hyperspace" (Edwards & Hardman, 1989)--bewildered by the unmapped network of ideas on the Internet. Teachers can guide students through the thinking and researching processes necessary to find their way, to structure ideas and recognize patterns of information.

McKenzie (1998) described this goal as that of "raising a generation of free-range students," grazing for information and knowledge on the Internet. I am not sure I completely like the analogy linking students with herd cattle, but her description of the kind of students we want to develop is a good one:

> Young people capable of navigating through a complex, often disorganized information landscape while making up their own minds about the important issues that affect their lives and their times. (p. 27).

She notes the link that is at the heart of my thesis in this chapter, as well. The same skills that students develop in well-guided activities using computers will serve them well in the tests of life, and also in the increasingly challenging state- and nationally-mandated achievement tests.

Our goal, after all, is not simply to teach our students to be mere consumers of information. Our goal is to lead them to be educated consumers of information. In his best-selling book Closing of the American Mind, Bloom (1987) made the important point that open mindedness is not an ultimate educational goal, despite tendencies in our culture to establish it as such. Open mindedness can be empty headedness, Bloom told us, if it is used as an excuse to avoid thinking through important issues in life. The intellectual goal of an educated person should be to examine issues, to weigh the evidence critically, and finally, to take a position based on these considerations. Chall, in her developmental model of reading (1983), likewise identified the ability to think through complex issues and to establish an intellectually valid position on them, as the highest stage in reading development (the stage

of Construction and Reconstruction: A World View).

It has been estimated that there are more than 4 million websites and hundreds of millions of documents on the Internet (Nielsen, 1999). Sorting through all such documents on any one topic may be a hopeless task--but it is also unnecessary. No student needs to read every book and magazine in a library in order to carry out substantive research on a topic. Likewise, no one needs to read every document on the Web about atmospheric pollution in order to draw firm and worthy conclusions on the topic. Teaching students to become "infotectives" (McKenzie, 1998), to do basic research on the Web follows most or all of the same principles involved in teaching research skills using traditional print-based library books and documents.

Insert Textbox 6: "What is an "Infotective"?

ALL My Students, Regardless of Socioeconomic or Other Factors, Will Be Successful in My Classroom

Just as the general issue of providing a quality education to the disadvantaged is the most difficult challenge facing American public education today, providing the disadvantaged access to IT will be a major challenge. The problem is not so much that schools in disadvantaged

communities have fewer computers per student. This problem can be readily solved in states that are at all concerned about the issue. The problem is that advantaged students have far greater access to computers at home, where the great bulk of their time-on-task with computers occurs.

Insert Textbox 7: Statistics on Equity

Insert Textbox 8: E-Rate Funding

Equity is also an issue with those teachers concerned about technology and gender. A far too common scene in classrooms has the boys crowded around the computer table and the girls engaged in non-technology activities. Some publishers are making efforts to develop software of interest to girls. Let's Talk About Me (Simon & Schuster Interactive) includes diaries, personality profiles, and advice from a variety of well-known women. The Baby-sitters Club Friendship Kit (Philips Media) is based on the popular series. Software includes a journal, a subprogram for making stationery, an address book, and games.

Concluding Remarks

So, let's get back to our title question. Is IT worthwhile? If I have

10 years left in the classroom, should I devote a significant portion of my time and effort to integrating technology into my curriculum, or should I choose some other important avenues of creative pedagogical endeavor?

We teachers will choose to answer the question differently, and I have no doubt but that the different ways in which we reach out to our diverse student population are all part of the reason the American public education system is so successful. Does Instructional Technology fit in? From one viewpoint, there's not much doubt but that that question has already been answered. The proliferation of computers in schools is readily apparent. Teachers are seizing on this new technology to promote their curricular goals.

In this chapter, we have looked at a wide variety of reasons for promoting use of Instructional Technology. From the issue of effectiveness to the issue of equity, all teachers will be able to find important reasons for making the time to learn about computers and to plan for their use in the classroom.

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Textbox 1: Internet Acceptable Use Policies and Netiquette

Internet Acceptable Use Policies and Netiquette

Among the difficulties faced by users of the Internet is that some users display inappropriate behavior. Partly this is due to a frontier mentality--the Internet is a new frontier and there is an appeal to its "untamed" quality. There is no accepted standard of behavior established as of yet. Of course, even if there were such established standards, there are no easy methods of policing such behaviors.

Yet there is certainly no need for educators or social leaders to give up on the Internet because of the behaviors of a few of its users. Already, state, federal and international law enforcement agencies are enforcing standards. In addition, Internet Service Providers (ISPs), including the largest of all, American OnLine, are beginning to enforce standards for their clients. If nothing else, fears of lawsuits or lost business is compelling them to action.

Schools must also play a role in teaching and enforcing appropriate behaviors. It is important for teachers and administrators to think through the issues and establish policies before problems occur. The American Association of School Administrators has a website (http://www.aasa.org/Issues/Techplans/plansTC.htm) which links to a variety of online policy statements on "acceptable use" and on appropriate behaviors (netiquette). One of the more useful is that offered by Eugene,

OR, public schools (http://www.4j.lane.edu/4jnet).

Textbox 2: Avoiding the "New Plagiarism"

Avoiding the "New Plagiarism"

How can we simultaneously help students avoid plagiarism from the Internet and help develop their research skills and creative thinking? Our assignments need to change from simple information gathering (e.g., "Tell me all you can find out about bottlenose whales.") in order to require insightful thinking based on organized research. Here are some examples.

In the "Animorphs" series by K. A. Applegate (Scholastic Inc., P.O. Box 7502, Jefferson City, MO 65102), a group of children are given the ability to "morph" into animals in order to fight evil alien invaders, the Yeerks. Imagine that you are given such power, to morph into a bottlenose whale. Carry out research on the Internet and in the school library that will provide you with information about bottlenose whales. Discuss which characteristics would be important to you if you were to morph into a whale. Use that information to create a multimedia presentation that combines Animorph adventure with details about life as a morphed bottlenose whale.

You have been selected by the President of the United States to serve on an advisory committee to determine whether a new Pathfinder mission should be sent to Mars. Carry out research on the Internet and in

the school library that will provide you with information about the 1997 Pathfinder mission and its findings. Determine whether you believe those findings to have been worth the effort and expense of the Pathfinder mission. Use the information to provide an oral report to the class that will offer conclusions as to whether a second mission is advisable.

Karchmer (in press) reported on Susan Silverman, a second grade teacher in New York, who has offered an Internet project entitled "Stellaluna's Friends" (http://www.kids-learn.org/stellaluna/) (See Chapter 4 for a plan that uses Stellaluna and Chapter 7 for more information about Silverman's activities and website), a title drawn from a children's picture book about a bat (Cannon, 1993). Students researched information about bats, then developed reports, stories, and poems about a bat that might live near them. The results were published on the class website.

Textbox 3: Internet Research Guide

Collaborative Internet Research Guide

Name _____ Topic _____

Date _____

What do we already know about our topic that will help us fulfill our assignment?

What are the questions we want to answer in our Internet research?

How can the task be divided among our group?

Notes

My Research Results - Related Results from My Group

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Textbox 4: What is an "Infotective"?

What is an "Infotective"?

An "infotective" (McKenzie, 1998) is a term designed for the Information Age "student thinker capable of asking questions about data in order to convert the data into information (data organized so as to reveal patterns and relationships) and eventually into insight (information that may suggest an action or strategy)" (p. 27). In the past, teachers provided information to students to be memorized and learned. In the Information Age, students must construct meaning. To do this, they must learn both traditional research skills (and the changes brought about in research tasks by electronic technologies) as well as the ability to do original thinking.

An infotective project can be organized as follows. Note that, as in all Writing Process approaches, the stages are recursive and students will typically move back and forth between them.

Development of the Question

Students think through the basic issues to be addressed and develop an interrelated web of questions that will drive the entire project.

Researching the Question

Students use electronic and traditional media to obtain data and information and to sort it in ways that address the

questions.

Organizing the Information

Students formally organize the data to provide answers to the questions in ways that are appropriate to their audience.

Presenting the Information

Information can be presented in a wide variety of ways to the intended audience: Public speaking or discussion, written essays, electronic text or multimedia.

Textbox 5: Statistics on Equity

Statistics on Equity

Ninety percent of schools in high socioeconomic areas have access to the Internet.

Seventy-eight percent of schools in low socioeconomic areas have access to the Internet (Kamp, 1999)

Textbox 6: E-Rate Funding

E-Rate Funding

Under the Telecommunications Act of 1996, Congress established the Universal Service Fund Education Rate (E-Rate) to support educational use of the Internet. Schools and libraries are applying for funding to underwrite the costs of Internet connections and hardware. The sheer size of this fund, expected to account for $1.9 billion in expenditures in 1999 (Kamp, 1999), is having a major impact in expanding student access to the Internet.